JOURNAL OF COMMUNITY SERVICE IN SCIENCE AND ENGINEERING

P-ISSN: 2962-1003 E-ISSN: 2962-0767

Homepage jurnal: http://jurnal.untirta.ac.id/index.php/JoCSE/

Pattern of cannabis and cigarette abuse among adolescent students in Sokoto and assessment of antinutritional components of the two drugs

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ARTICLE INFO

Article history:
Submitted 1 February 2023
Reviewed 20 February 2023
Received 1 March 2023
Accepted 15 March 2023
Available online on 1 April 2023

Keywords:
Substance abuse, drug, cyanide, academic performance, tannins, alkaloids.

Kata kunci:
Penyalahgunaan zat, narkoba, sianida, prestasi akademik, tanin, alkaloid.

ABSTRACT

This study aimed to determine the pattern of cannabis and tobacco use among adolescent students in Sokoto and measure antinutritional factors in the two drugs. Qualitative and quantitative standard methods were applied. Reagents and materials of analytical grade were used to evaluate the antinutrients. Signs of drug abuse among adolescents are untidiness (33.3%), blackening of lips and toes (24.2%), poor concentration (20.0%), poor/foul odor (12.1%), false images (6.7%), hostility (5.5%), and reduced weight (1.2%). The perceived causes of drug abuse are peer pressure (36.4%), poor parental guidance (30.3%), labor/work (15.2%), learning musical art (9.1%), unemployment (6.1%), and sports (3.0%). The submitted effects linked to cannabis and cigarette revealed are health effects (27.3%), followed by poor academic performance (24.2%), confusion (21.2%), school dropout (16.9%), disrespect (7.3%), and lastly disrespect (3.0%). The preventions are strict restriction on drugs (33.3%), education/awareness about the effects of drug abuse (26.7%), religious intervention (21.2%), avoiding deviant peers (9.7%), and poor parental guidance (9.1%). Substance abuse is a menace among the studied adolescents, and antinutrients present in the drugs affect the users, especially their academic performance.

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pola penggunaan ganja dan tembakau di kalangan pelajar remaja di Sokoto dan mengukur faktor antigizi pada kedua obat tersebut. Metode standar kualitatif dan kuantitatif digunakan dalam penelitian ini. Reagen dan bahan kelas analitik digunakan untuk mengevaluasi antinutrien. Tanda-tanda penyalahgunaan narkoba di kalangan remaja adalah penampilan acak-acakan (33,3%), bibir dan jari kaki menghitam (24,2%), kurang konsentrasi (20,0%), tidak sedap/bau busuk (12,1%), citra palsu (6,7%), membuat keributan (5,5%), dan penurunan berat badan (1,2%). Penyebab penyalahgunaan narkoba yang dirasakan adalah tekanan dari teman sebaya (36,4%), bimbingan orang tua yang buruk (30,3%), buruh/bekerja (15,2%), belajar seni musik di tempat yang kurang baik (9,1%), pengangguran (6,1%), dan olahraga (3,0%). Efek yang diajukan terkait dengan ganja dan rokok yang terungkap adalah efek kesehatan (27,3%), prestasi akademik yang buruk (24,2%), kebingungan pada tujuan hidup (21,2%), putus sekolah (16,9%), tidak peka (7,3%), dan terakhir rasa hormat rendah (3,0%). Salah satu upaya pencegahannya yaitu pembatasan narkoba yang Ketat (33,3%), pendidikan/kesadaran tentang dampak penyalahgunaan narkoba (26,7%), intervensi agama (21,2%), menghindari pergaulan yang menyimpang (9,7%), dan bimbingan orang tua (9,1%). Penyalahgunaan zat merupakan ancaman di kalangan remaja yang diteliti dan antinutrien yang terkandung dalam obat-obatan tersebut mempengaruhi penggunanya, terutama prestasi akademis.

Available online at http://dx.doi.org/10.36055/jocse.v2i1.19802.

1. Introduction

Education is a way of teaching formal knowledge to the recipient/s, delivered at schools or related institutions of learning. In education, students are trained to learn, read, and write, so they are institutionalized with a specialization that helps them acquire and perform the job effectively. Education makes a boy or girl with special training or learning to be able to earn a living in future life. Education is a tool that develops humans morally, mentally, socially, and emotionally to move out of poverty and become beneficial to society at large. Educated people are groomed with abilities, competencies, and training to work to move the economy forward. Therefore, education instigates social stability, mobilization, and proper socialization in the community and society [1-5]. Every child, especially the adolescent, is essential in society. The adolescents are faced with several challenges ranging from poorly developed/developing body systems, the effect of poor pressure, experimentation, curiosity, a strong urge for independence, and poor life experiences. Therefore, require effective education to socialize and become valuable members of society. However, a significant threat to education and adolescents nowadays in many parts of the world, including Sokoto state, is rising substance abuse prevalence [6-9].

Substance abuse is regarded in many terms. It is a behavior of taking drugs in a fashion that leads to impairment of body functioning or a visible failure at school, home, or any place of work [10]. Substance abuse, on many occasions, has to do with youngsters taking drugs/ psychoactive chemicals without legitimate cause or prescription/ medical indication [6]. The menace of drug abuse among adolescents has been on the rise worldwide, with many of them consuming multiple substances for various reasons, leading to diverse effects on the users and society. Factors such as peer pressure, poor parental guidance, labor, experimentation, personality, family issues, academic problems, and others are among the identified factors linked with adolescent drug abuse nowadays [6, 11].

Indeed, adolescent drug abuse affects education negatively in many ways. Adolescents who engage in drug abuse, let alone the use of cigarettes and cannabis, are faced with poor relationships with peers and staff at school, academic difficulty, the tendency for risky behaviors, illnesses, violence, diseases, psychological distress, and other physical effects. Therefore, unhealthy adolescents tend to be hospitalized or have to avoid school/ class for treatment, which affects their education or academic performance. Conversely, adolescent drug users tend to have psychological instability that affects learning through several pathways [12-13]. Nevertheless, the effects manifesting due to cigarettes or cannabis, or any drug of abuse in adolescents are due to the chemical constituents of the drug thereof. Because tobacco and cannabis are of plant origins and due to pollution, they have tendencies to contain antinutritional factors that adversely affect humans, let alone adolescents [13].

However, antinutrients present in plant-based products such as cannabis and tobacco are made initially to serve as protection for the plants against microbial attack, parasitic attack, herbivore attack, and relations [14-17]. Intake of cannabis and tobacco is an intake of these toxins (antinutrients). In turn, they can build up in the body and impede the intake, digestion, absorption, and utilization of helpful food nutrients [17]. Parable oxalate affects calcium and magnesium metabolism and also inhibits pectin digestion. It also affects the kidney by forming insoluble salts that form stones [17]. Phytate makes essential elements inaccessible by making compounds that reduce absorption and digestion in the intestine. Alkaloids act on the nervous system and disrupt the standard transmission of impulses. Cyanide or its relations form hydrogen cyanide that, in turn, inhibits the cytochrome oxidase and other valuable enzymes. Tannins bind proteins, forming complexes due to their phenolic groups and decreasing food intake, growth, and digestion [16-18]. In this vein, adolescence is a pivotal period of human life that is known for the fastest physical, sexual, psychosocial, cognitive, and related development; therefore, an adolescent needs better and proper nutrition to achieve potential and goals [16-17]. Therefore, the intake of cannabis and tobacco laced with antinutrients could harm the health, education, and other aspects of youngsters and the nation's economy [19]. This study aimed to determine the pattern of cannabis and tobacco use among adolescent students in Sokoto and measure antinutritional factors in the two drugs, as shown in Figure 1.

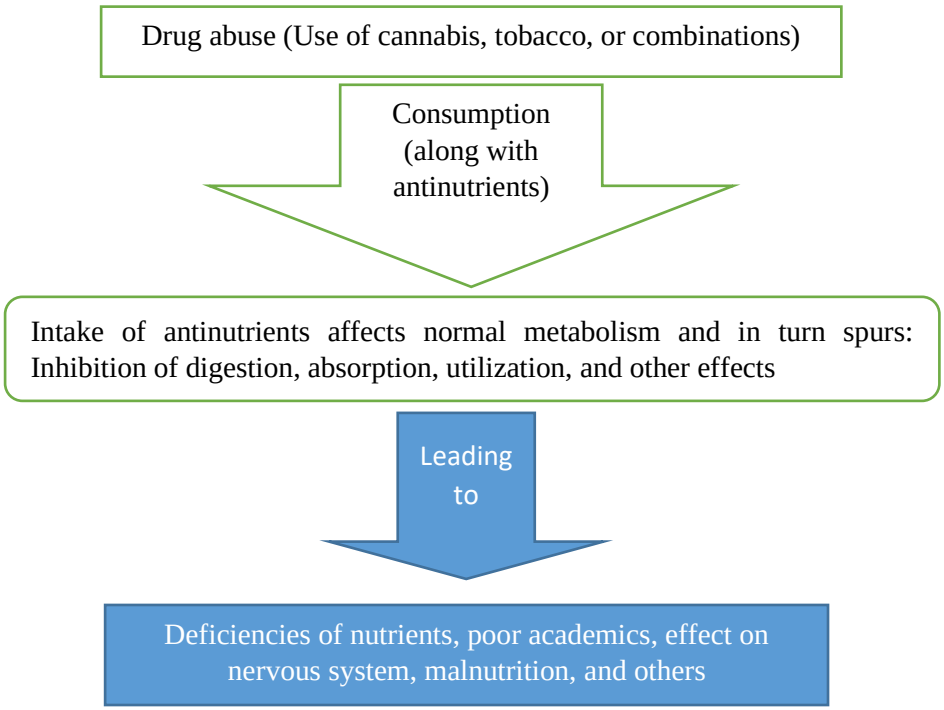

Figure 1. Showing the mechanism of antinutrients effects on adolescents.

The study aimed to examine what levels of antinutrients in Cannabis and cigarettes were collected in Sokoto, what were the demographic characteristics of the respondents, how was the distribution of Cannabis and cigarette use among teenage students in Sokoto, what were the perceived

signs and characteristics of cannabis/cigarette abuse among adolescents in Sokoto, what are the possible causes of Cannabis and cigarette abuse among adolescents in Sokoto, what are the effects experienced from Cannabis or cigarette abuse among adolescents in Sokoto, and what are the recommendations for the prevention of marijuana and cigarette abuse among adolescents in Sokoto.

2. Method

The study was carried out in Sokoto State, Nigeria. The map of the area is denoted in Figure 2. The respondents' information pertaining to this work was collected through a semi-structured questionnaire with subsections. Section A asked about the demographics, section B asked about the use of the drugs, section C asked about the signs of drug abuse among adolescents, section D asked about the effects and possible causes of drugs, and Section E asked about possible prevention of drugs in adolescents. The sample size was 330, calculated using a Raosoft calculator, and the obtained questionnaires were analyzed using descriptive statistics to give frequency and percentage; in addition to that, the X^2 was used to test the results $p < 0.05$. Tobacco and Cannabis were collected from Sokoto City, Nigeria. The alkaloids, oxalate, cyanide, tannins, and phytate were determined as reported in the standard procedure mentioned in [20].

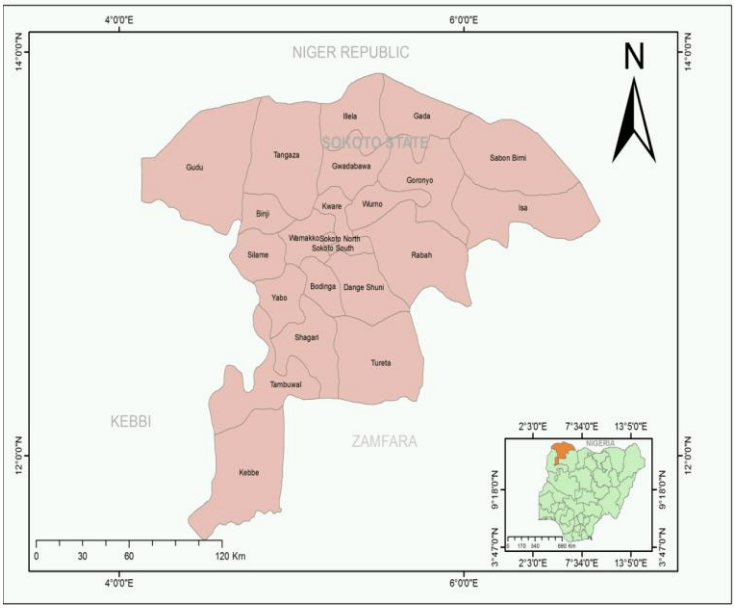

Figure 2. Map of the study location [21].

3. Results and Discussion

3.1. The levels of antinutrients in cannabis and cigarette collected in Sokoto

Various concentrations of antinutritional factors present in some tobacco and cannabis collected from Sokoto are shown in Table 1. Therein, tobacco contains more of the observed antinutrients than cannabis, an observation that might be due to pollution from the environment utilized in growing the crop and pollution that might have occurred along the course of production or processing of the drug [19, 21-22]. In addition to that, tobacco contains much cyanide (38.0±1.3 mg/100g), followed by phytate (35.0± 0.15 mg/100g), then alkaloids (25.0±0.5 mg/g). Others are Oxalate (20.0±2.1 mg/100g) and tannins (18.2±1.6 mg/100g). Cannabis contains more cyanide (28.0±2.1 mg/100g), Oxalate (16.0±1.0 mg/100g), followed by phytate (15.0±0.05 mg/100g). Other constituents are Alkaloids (13.0±1.3 mg/100g) and tannins (10.2±1.0 mg/100g). Notably, the antinutrient content of the drugs (cannabis and tobacco) is higher than the levels of phytate, Oxalate, and alkaloids found in vegetables in Bauchi, Nigeria [23].

Table 1. The distribution of antinutrients in cannabis and cigarette collected in Sokoto, Nigeria.

Types of psychoactive substance/ drug	Phytate (mg/100g)	Oxalate (mg/100g)	Alkaloids (mg/100g)	Cyanide (mg/100g)	Tannins (mg/100g)
Tobacco	35.0 ± 0.15	20.0 ± 2.1	25.0 ± 0.5	38.0 ± 1.3	18.2 ± 1.6
Cannabis	15.0 ± 0.05	16.0 ± 1.0	13.0 ± 1.3	28.0 ± 2.1	10.2 ± 1.0

(values are expressed as mean ± standard deviation)

The results also contribute to the phytate, tannins, and oxalate levels determined in cereals (maize and rice) from Sokoto [24]. Moreover, the tannins, phytate, alkaloids, and Oxalate found in this work are comparatively higher than those observed in Moringa collected in Sokoto [18]. Impliedly, the two drugs of abuse might be more likely to contain antinutrients than other vegetables and other edible plants. Usually, plants are in the habit of innovating protection strategies against invading microbes (parasites) and attacks by predators. Therefore, they manufacture antinutrients as protective measures [25-26]. Nevertheless, the consumption of cannabis and tobacco observed in this study by adolescents is coupled with the consumption of antinutrients found

(Table 1) therein. Therefore, the behavior is dangerous to health and learning because the antinutrients hinder digestion, absorption, bioavailability, and utilization of valuable food materials adolescents consume.

The behavior leads to deficiencies, malnutrition, disorders, and poor health [27]. Unhealthy, malnourished individuals abstain from classes/ schools (for health seeking), affecting their performance. Even if they attend classes, they usually perform poorly because proper food is essential for growth, development, and learning [28, 7-9]. Specifically, phytate naturally occurs in plants and can be complex with positively charged valuable minerals like iron, zinc, phosphorus, and other micronutrients needed for development and growth. Tannin compounds bind and cause the precipitation of proteins and other beneficial organic compounds like proteins. They can also interfere with iron metabolism [29]. Oxalate can lead to kidney stones and other consequences [26-27]. Alkaloids at higher concentrations spur anticholinergic poisoning. A range of 11-25mg/kg can lead to death in children [27]. They also can elicit hallucinations, stimulation, induction, and infertility.

Otherwise, cyanide can affect nutrients such as iodine, which are essential in youngsters' growth and development and learning ability [29-30]. It is worth stating that the presence of antinutrients in the two drugs is excellent potential to affect the education of the adolescents taking cannabis and tobacco in Sokoto by causing malnutrition, deficiencies, ill-health, school absenteeism, and poor cognitive ability [31-32]. Care needs to be taken to educate the public (especially the youth) on the harmful nature of drug use, and strict law implementation is needed to scuttle the selling and buying of drugs in question [10].

3.2. The demographic characteristics of the respondents

Demographic characteristics of respondents based on age, namely, 12-15 years, were 165 people (50%), and over 15 years were 165 people (50%). All respondents were male, Muslim, and from the Hausa/Fulani ethnic group. Based on education, 15 respondents had elementary school education (4.5%), 50 junior high school students (15.2%), 100 high school students (30.3%), and 165 college students (50%).

3.3. The distribution of cannabis and cigarette use among adolescent students in Sokoto

The distribution of cannabis and cigarette use among adolescent students in Sokoto, Nigeria, is shown in Table 2. The most used drug was tobacco (50.0%), followed by cannabis (33.3%) and a combination of drugs (16.7%). Substance abuse refers to using a drug or any psychoactive substance in a harmful manner or without the prescribed need [7-9]. The types of drugs used by adolescents found in this study (Table 3) were similar to what was reported by another Sokoto study. In another streak, Aliyu et al. (2016) reported the practice of smoking (cigarette and relations) among youths in the North-Central zone of Nigeria. They echoed that smoking was a recipe for other drugs/ psychoactive substances use among youth. It has spurred youths to use even non-conventional substances such as moringa, zakami, rubber solution, premium motor spirit, lizard dung, and others [33]. Another study related a high prevalence of substance abuse among youth in Nasarawa, a Northern state similar to Sokoto in many aspects [11].

Table 2. The distribution of cannabis and cigarette use among adolescent students in Sokoto, Nigeria.

Types of psychoactive substance/ drug	Frequency	Percentage	X^2	Remarks
Cannabis	110	33.3		
Cigarette	165	50.0	55.000	Significant
Combination	55	16.7		
Total	330	100.0		

3.4. Signs and features of cannabis/ cigarette abuse among adolescents in Sokoto

The possible signs and features of cannabis or cigarette abuse among adolescents are shown in Table 3. The most stated sign was untidiness (33.3%), followed by blackening of lips and toes (24.2%), then poor concentration (20.0%), and poor body odor (12.1%). Others are false images (6.7%), hostility (5.5%), and reduced weight (1.2%). Invariably, these signs were reported elsewhere [10] and are essential portends that help parents and caregivers or any stakeholder to prevent drug abuse in adolescents at early stages before escalation or deterioration occurs [7-9].

Table 3. The perceived signs and features of cannabis/ cigarette abuse among adolescents in Sokoto.

Features/ signs of psychoactive substance/ drug use among adolescents	Frequency	Percentage
Untidiness	110	33.3
Blacken lips and toes	80	24.2
Poor concentration	66	20.0
Poor/ bad odor	40	12.1
False images	22	6.7
Hostility	18	5.5
Reduced weight	4	1.2
Total	330	100.0

3.5. The perceived possible causes of cannabis and cigarette abuse among adolescents in Sokoto

The perceived possible causes of cannabis and tobacco abuse among adolescents in Sokoto, Nigeria, are shown in Table 4. The causes are enumerated in the order of frequency as follows: Peer pressure (36.4%), Poor parental guidance (30.3%), Labour/ work (15.2%), Learning musical art (9.1%), Unemployment (6.1%), and Sports (3.0%). Indeed, substance abuse is caused, associated with, and linked to many factors, especially among youths which need to be expunged for better prevention of the prevalence of the menace. Similar to the findings of this study (Table 4), peer pressure was also a highly

prevalent factor of drug abuse among youths, as related by [11] in Nasarawa, Nigeria. Peer pressure was also related as a determinant of drug abuse among undergraduates in Southeastern Nigeria [34]. A study has revealed that people who are friends with drug abusers are more prone to indulge in the act than their counterparts [11]. Other causes of drug abuse are diverse [34].

Table 4. The perceived possible causes of cannabis and cigarette abuse among adolescents in Sokoto.

Possible causes of drug abuse	Frequency	Percentage	X^2	Remark
Peer pressure	120	36.4	184.545	Significant
Poor parental guiding	100	30.3		
Labour/ work	50	15.2		
Learning musical art	30	9.1		
Unemployment	20	6.1		
Sports	10	3.0		
Total	330	100.0		

3.6. Experienced effects of cannabis or cigarette abuse among adolescents in Sokoto, Nigeria

The outcome shown in Table 5, the possible effects seen by the adolescents linked to cannabis and tobacco revealed, Health effects (27.3%), followed by Poor academic performance (24.2%), then confusion (21.2%), school dropout (16.9%), disrespect (7.3%), and lastly disrespect (3.0%). A surf of literature has revealed that substance abuse also negatively affects users and non-users. Similar to this work, physical effects were reported elsewhere (Table 5). They involve illness or signs such as coughing, dizziness, weight loss, unperturbed sleeping, weakness, sickness, and withdrawal, as reported in a Sokoto study [8]. Other effects are on the social and psychological well-being of the users, such as mood alteration, low sexual desire, poor relationship with others, well-being, misbehaviors, and others, found by [8-9]. [33] reported similar effects to this finding (Table 5), such as hospitalization and injuries.

Table 5. Experienced effects of cannabis or cigarette abuse among adolescents in Sokoto.

Experienced effects of drug abuse	Frequency	Percentage	X^2	Remark
Health effects	90	27.3	92.036	Significant
Poor academic performance	80	24.2		
Confusion	70	21.2		
School dropout	56	16.9		
Disrespect	24	7.3		
Unemployment	10	3.0		
Total	330	100.0		

3.7. The suggestions for prevention of cannabis and cigarette abuse among adolescents in Sokoto

The possible ways to prevent cannabis and cigarette abuse among adolescents in Sokoto, Nigeria, as suggested by the respondents, are shown in Table 6. The suggestions are in descending order of frequency as enumerated below: Strict restriction on drugs (33.3%), Education/ awareness about the effects of drug abuse (26.7%), Religious intervention (21.2%), Avoiding bad peers (9.7%), and Proper parental guiding (9.1%). [33] echoed for more educational and awareness approaches, family interventions, and drug laws interventions to help prevent drug abuse among youths in the Northern part of Nigeria, similar to some suggestions offered in this work (as indicated in Table 6). In this vein, [11] suggested public awareness enhancement, public health interventions, and constant education of parents to their wards on the negative effects of drugs.

Likewise, another study elsewhere hinted at the influence of religion on reducing drug abuse. Therefore, using religious leaders to preach on the spiritual consequences and toils for the drug users would invariably help in deterring many from drugs/ psychoactive substances at school, home, or elsewhere [35]. In a nutshell, the findings of this study show that adolescents and students are still practicing the practice of drug abuse, and the antinutritional contents of the drugs can severely affect the health, education, and nutrition of consumers with outward consequences. Religious measures help prevent the trend, and parents are expected to pay much attention to their wards regarding substance abuse. Likewise, governments should properly implement drug control and prevention policies because promising youngsters are needed for the growth and development of the entire nation.

Table 6. Suggestions for prevention of cannabis and cigarette abuse among adolescents in Sokoto.

Prevention of drug abuse among adolescents	Frequency	Percentage	X^2	Remark
Strict restriction on drugs	110	33.3	74.061	Significant
Education/ awareness about the effects of drug abuse	88	26.7		
Religious intervention	70	21.2		
Avoiding bad peers	32	9.7		
Proper parental guiding	30	9.1		
Total	330	100.0		

4. Conclusion

Substance abuse is a menace among the studied adolescents, and antinutrients present in the drugs affect the users, especially their academic performance. This study revealed that adolescent students in Sokoto take cannabis and tobacco drugs and show some signs due to the action. Likewise, there are possible ways to prevent the habit of drug abuse. However, the two examined drugs contain antinutrients (oxalate, phytate, tannin, alkaloid, cyanide) that are in significant amounts and, in turn, can affect the health, education, and development of the users by eliciting malnutrition, deficiencies, and other

nutrition-related abnormalities. Therefore, drug abuse should be controlled by implementing strict policies that prevent selling and buying; parents should give proper care, and religious interventions are needed, among others.

REFERENCE

[1] Ibrahim, Y., Arshad, R., & Salleh, D. (2017). Stakeholders perceptions of secondary education quality in Sokoto state. *Nigeria Quality Assurance*, vol. 5, no. 1, pp. 22-31. DOI: http://dx.doi.org/ doi.10.1108/QAE-04-2016-0021.

[2] Paul, P. K., & Aremu, B. (2020). International center for curriculum and research development (ICCRD): The foundation, aim, and future of an interdisciplinary and Advanced unit of Crown University International Chartered Incorporated (CUICI), Argentina, South America- A case study. *Learning Community*, vol. 11, no. 1, pp. 27-40.

[3] Hiliya, A. A., Jabo, A. J., Naabu, A., Sarkingobir, Y., & Muhammad, B. I. (2022). The role of elementary school teachers as perceived by students in the Nasarawa local government area, Kano, Nigeria. *International Journal of Advances in Social and Economics*, vol. 4, no. 2, pp. 37~43. DOI: https://dx.doi.org/10.33122/ijase.v4i2.231.

[4] Gbesoevi, E. S., Adeleke, A. A., & Ajiboye, S. O. (2022). Determinants of educational wastages amongst public secondary schools' students in Lagos state, Nigeria. *Journal of Education & Humanities Research*, vol. 14, no. 2, pp. 1-11.

[5] Sarkingobir, Y., Hiliya, A. A., & Umar, K. (2022). Schools in Nigeria; An assessment of water, sanitation, and hygiene in Sokoto sate. *Archives of Educational Studies*, vol. 2, no. 2, pp. 223-242.

[6] Aliyu, D., Adeleke, I. T., Anyebe, E. E., Omoniyi, S. O., & Ibrahim, L. Y. (2016). Occurrence, pattern and effects of nonconventional use of substances among youth in North-Central, Nigeria. *World Journal of Preventive Medicine*, vol. 4, no. 1, pp. 12-19.

[7] Nasiru B. S. (2015): Perceptions of youth on substance abuse in Sokoto, Sokoto State, Nigeria. [*Dissertation*]. Legon: Master of Science Nursing Degree, University of Ghana.

[8] Nasiru, B. S., Lydia, A., Alexander, A., & Maru, S. A. (2019a). The perception of youth on the effects of substance abuse in Sokoto, sokoto state, Nigeria. *World Journal of Pharmaceutical and Medical Research*, vol. 5, no. 9, pp. 122-129.

[9] Nasiru, B. S., Musawa, T. S., Hassan, H. M, & Ejembi, E. A. (2019b). Exploring the perceived factors that lead to substance abuse among youth in Northern Nigeria. *Advance Research Journal of Medical and Clinical Science*, vol. 5, no. 9, pp. 15-23.

[10] Nasiru, B. S., Yakubu, L, Abdulrahman, S. M., Auwal, M., Abdulrahman, S., & Zulkifilu, M. (2018). Youth perception on control measures in reducing substance abuse in Sokoto state, Nigeria. *International Journal of Nursing and Medical Science*, vol. 7, no. 2, pp. 736-754.

[11] Henry, D. P., Hezekiah, A. O., & Kasim, B. T. (2021). Subsatnce abuse: Prevalence and the determinant factors among youths in Jigwada Area, Nasarrawa State, Nigeria. *International Journal of Management, Social Sciences, Peace and Conflict Studies*, vol. 4, no. 3, pp. 193-210.

[12] Okafor, I. P. (2020). Causes and consequences of drug abuse among youth in Kwara state, Nigeria. *Canadian Journal of Family and Youth*, vol. 12, no. 10, pp. 147-162.

[13] Adeniyi, A. O. (2022). Effect of drug abuse on the academic performance of secondary school students in Nigeria. *European Journal of Biology and Medical Science Research*, vol. 10, no. 3, pp. 72-79.

[14] Hassan, L. G., Bagudo, B. U., Aliero, A. A., Umar, K. J., Abubakar, L., & Sani, N. A., (2011). Evaluation of nutrient and antinutrients contents of Parkia biglobosa (L.) flower. *Nigerian Journal of Basic and Applied Science*, vol. 19, no. 1, pp. 76-80.

[15] Igwilo, I. O., Okonkwo, J. C., Ugochukwu, G. C., Ezekwesili, C. N., & Nwenyi, V. (2017). Comparative studies on the nutrient composition and antinutritional factors in different parts of Moringa oleifera plant found in Akwa, Nigeria. *The Bioscientist*, vol. 5, no. 1, pp. 1-12.

[16] Vikram, N., Katiyar, S. K., Singh, C. B., Husain, R., & Gnagwar, L. K. (2020). A review of antinutritional factors. *International Journal of Current Microbiology and Applied Sciences*, vol. 9, no. 5, pp. 1128-1137.

[17] Veer, S. J., Pawar, V. S., & Kambale, R. E. (2021). Antinutritional factors in foods. *The Pharma Innovation Journal*, vol. 1, no. 10, pp. 1-4.

[18] Na-Allah, Y., Bello, A., & Kabir, N. (2017). Evaluation of nutrient and antinutrients factors of leaves of moringa (Moringa oleifera) in Sokoto, *Nigeria. Direct Research Journal of Agriculture and Food Science*, vol. 5, no. 120, no. 433-437. DOI: http://dx.doi.org/10.5281/zenodo.3534189.

[19] Sarkingobir, Y., Lawal, A. A., & Bello, Z. (2021). COVID-19: causing increased pollution of waterbodies by plastics and consequent effects. *Journal of Water Pollution and Purification Research*, vol. 8, no. 1, pp. 20-24.

[20] Labbo, A. M., Umar, AI. Shehu, S., Isah, M., & Ayuba, S. A. (2021). Heavy metals and physicochemical assessment of some selected sachet water around Sokoto Metropolis, Nigeria. *Caliphate Journal of Science and Technology (CajoST)*, vol. 3, no. 1, pp. 69 – 75.

[21] Hamza A, Gumi, A. M., Aliero, A. A., Umar, A., Sarkingobir, Y., & Tambari, U. (2023). Potential of neem leaves on preservation of selected elemental compositions in two tomato cultivars from Sokoto, Nigeria. *Journal of Bioresources and Environmental Sciences*, vol. 2, no. 1, pp. 15-20. DOI: http://dx.doi.org/10.14710/jbes.2022.17343.

[22] Umar, A. I., Sarkingobir, Y., and Dikko, M., (2022). Spectro-analytical research of selected heavy metals (Cu, Cd, Cr, and Pb) in four different single-use plastics commonly in contact with food from Sokoto, Nigeria. *Jurnal Teknokes*, vol. 15, no. 1, pp. 76-80. DOI: https://dx.doi.org/10.35882/tekenokes. v15i2.199.

[23] Nuhu, A. H., Shiitu, F. A., & Tijani, R. A. (2015). Determination of proximate, antinutrients and some trace elements of Trinidad moringa scorpion, bell pepper and cayenne pepper. *Proceedings of the Academic Conference of African Scholar Publications and Research International, Bauchi State University Gadau*, vol. 8, no. 1, pp. 1-13.

[24] Usman, A., Yaradua AI, Nasir, A., Matazu, K.I., Abdullahi, A. S., Matazu, N. U., Salisu, A., Barde, M. I., Musa, A., Koko, S. A., & Umar, R. A. (2019). Influence of heating on antinutritional factors on maize and rice cereals. *UMYU Journal of Microbiology Reserach*, vol. 4, no. 2, pp. 14-17.

[25] Makkar, H. P. S., & Becker, K. (1999). Plant toxins and determination methods to improve feed quality of tropical seeds- Review. *Asian Australian Journal of Animal Science*, vol. 12, no. 3, pp. 467-480.

[26] Alonso-Esteban, J. I., Torija-Isasa, M. E., & Sanchez-Mata, M. (2022). Mineral elements and related antinutrients, in whole and hulled hemp (Cannabis sativa L) seeds. *Journal of Food Composition and Analysis*, vol. 109, pp. 104516.

[27] Duraiswamy, A., Sneha, N. M., Jebakani, S. K., Selvaraj, S., Pramitha, L. J., Selvaraj, R., Petchiammal, I. K., sheriff, S. K., Thinakaran, J.,

Rathinamoorthy, S., & Kumar, R. P. (2022). Genetic manipulation of antinutritional factors in major crops for a sustainable diet in future. *Frontiers in Plant Science*, vol. 13, pp. 1070398. DOI: http://dx.doi.org/10.3389/fpls.2022.1070398.

[28] Bagilkar, V., & Savanadatti, B. B. (2015). A descriptive study on malnutrition. *Asian Journal of Nursing Education and Research*, vol. 5, no. 1, pp. 72-75.

[29] Abbas, G. (2020). An augmented review about antinutrients and toxins of feed stuff and their control strategies, a step toward sustainable resource utilization. *International Journal of Agriculture Innovations and Research*, vol. 8, no. 4, pp. 361-377.

[30] Zia, M. H., Watts, M. J., Gardner, A., & Chemery, S. R. (2014). Iodine status of soils, grain crops, and irrigation waters in Pakistan. *Environmental Earth Science*, vol. 73, pp. 7995-8008. DOI: http://dx.doi.org/10.1007/s12665-014-3952-8.

[31] Umar, A. I, Umar, R. A., Wasagu, R. S. U, & Oche, M. O. (2018). Effect of inadequate iodine status on academic performance of secondary schools girls in Sokoto State Nigeria. *Greener Journal of Epidemiology and Public Health*, vol. 6, no. 1, pp. 29- 33.

[32] Umar, A. I., Umar R. A., Wasagu R. S. U., & Oche M. O. (2017) Assessment of Iodine levels of Secondary Schools Girls in Sokoto State Nigeria. *International Journal of Food and Nutritional Science*, vol. 2, no. 1, pp. 20 –27.

[33] Aliyu, A. B., Ibrahim, M. A., Ibrahim, H., Dambatta, M. B., & Oyewale, A. O. (2017). GC-MS analysis of pavetta corymbosa lipophilic extract and its antimicrobial activity. *Ife Journal of Science*, vol. 19, no. 2, pp. 363-368.

[34] Ojiaku, M. O., & Nwokoro, C. O. (2021). Are personality type and peer pressure determinants of drug abuse among university students?. *Journal of Social Behavior and Community Health*, vol. 5, no. 2, pp. 706-712. DOI: http://dx.doi.org/10.185502/jsbch.v5i2.7831.

[35] Bakare, A. T. & Isah, B. A. (2016). Psychoactive substances use among inpatients in a Nigerian neuropsychiatric hospital; prevalence, pattern and presentation. *MOJ Addiction Medicine and Therapy*, vol. 2, no. 1, pp. 18-22.